DETAILED ACTION

Drawings

1. The drawings are objected to because of the following informality:

a. Reference character "132" in Fig. 3 is not mentioned in the specification. One more "132" is present in Fig. 3 of the Replacement Drawings.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

2. Claim 1 is objected to because of the following informalities:

a. Claim 1, lines 9-10 – "to be modulate intensity thereof" is presumed to be intended as "to modulate intensity thereof".

b. Claim 1, line 24 – "and to the pump and *and* to the radiator" is presumed to be intended as "and to the pump and to the radiator".

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. **Claim 1** is rejected under 35 U.S.C. 103(a) as being unpatentable over Numata et al. (US 6,256,083 B1), of record, in view of Braun et al. (US 6,829,081 B2).

Regarding **claim 1**, Numata discloses a liquid crystal projector (see Fig. 3), comprising:

a light source (12, Fig. 3);

an optical element (14, 15 and 17, Fig. 3) for changing the light from said light source into a parallel light, to be divided into three (3) light beams (col. 7, lines 29-43; col. 11, lines 17-44; and col. 13, line 48 – col. 14, line 3);

three (3) kinds of liquid crystal panels (11, Fig. 3, and 11R, 11G and 11B, Figs. 8-9) for transmitting the three (3) light beams divided by said optical element therethrough, so as to modulate intensity thereof (col. 11, lines 17-35);

an optical synthesizing means (41, Figs. 7-15) for synthesizing the three (3) light beams, passing through said three (3) kinds of liquid crystal panels, to be modulate intensity thereof (col. 14, lines 26-33);

a projection means (1b, Fig. 3, and 1, Figs. 8-10, 12 and 13) for projecting the three (3) light beams, which are synthesized by said optical synthesizing means (col. 14, lines 34-41); and

a liquid cooling cycle, including a radiator (see 6 and 19, Figs. 1, 4-7, 11, 14 and 15; col. 7, line 63 – col. 8, line 12 and col. 16, lines 17-29) therein, for circulating a liquid coolant (5, Figs. 1, 4-8 and 10-15; col. 9, lines 6-13) within and through said three (3) kinds of liquid crystal panels, so as to conduct cooling thereof (col. 7, line 63 – col. 8, line 12; col. 10, lines 17-47; col. 12, lines 40-47; col. 12, line 55 – col. 13, line 8; and col. 16, lines 17-29), wherein

each of said three (3) kinds of liquid crystal panels defines a flow channel (see area containing 5, Figs. 1, 4-8 and 10-15) therethrough for the liquid coolant circulating between a surface of said liquid crystal panel (see 2, Figs. 1, 4-8 and 10-15) and a transparent member (see 3b, Fig. 1, for instance) to be disposed opposing thereto, respectively, and further, said flow channel includes a high-resistance flow channel being flat and uniform in thickness thereof (see channel containing 5 in between 2 and 3b, Fig. 1, for instance), covering a liquid crystal panel area of said liquid crystal panel, and also a buffer portion formed neighboring to one of an upstream side and a downstream side of said high-resistance flow channel (see larger areas containing 5 at upstream and downstream sides of high-resistance flow channel, Fig. 1, for instance) (The high-resistance flow channel is considered to have a “high-resistance flow” since it occupies a smaller area relative to the “buffer portions” which occupy a larger area.).

Numata fails to explicitly disclose a closed loop liquid cooling cycle, including a pump, wherein said buffer portion being coupled to one of an inlet and outlet of the liquid crystal panel for the liquid coolant circulating therethrough, and to the pump and to the radiator to form the closed loop liquid cooling cycle.

However, Braun discloses a closed loop liquid cooling cycle (see Fig. 2), including a pump (62) and a radiator (60) therein, for circulating a liquid coolant (see 56) within and through a liquid crystal panel (see 10, Fig. 1, and 46 and 48, Fig. 2), so as to conduct cooling thereof (col. 3, line 55 – col. 4, line 37), wherein a buffer portion (see area surrounding 48) being coupled to one of an inlet (52) and outlet (54) of the liquid crystal panel for the liquid coolant circulating therethrough, and to the pump and to the radiator to form the closed loop liquid cooling cycle (see Fig. 2).

It would have been obvious to one having ordinary skill in the art at the time of applicant's invention to incorporate a closed loop liquid cooling cycle, including a pump, wherein said buffer portion being coupled to one of an inlet and outlet of the liquid crystal panel for the liquid coolant circulating therethrough, and to the pump and to the radiator to form the closed loop liquid cooling cycle, as in Braun, into the liquid crystal projector of Numata to effectively cool the liquid crystal panels to prevent damage caused by overheating (Braun, col. 3, lines 1-12).

5. **Claims 3 and 5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Braun et al. (US 6,829,081 B2) in view of Numata et al. (US 6,256,083 B1), of record.

Regarding **claim 3**, Braun discloses a liquid crystal panel (see 10, Fig. 1, and 46 and 48, Fig. 2) for use in a liquid crystal projector (col. 5, lines 5-13) in which a pump (62, Fig. 2) and a radiator (60, Fig. 2) enable circulation of a liquid coolant (see 56, Fig. 2) within and through the liquid crystal panel in a closed loop liquid cooling cycle (see Fig. 2), comprising:

two (2) pieces of transparent substrates (28 and 42, Fig. 1), enclosing a liquid crystal (12, Fig. 2) between them; and further

at least a transparent plate (30, Fig. 1), being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to form a flow channel (38, Figs. 1-2) for the liquid coolant circulating between them (see Fig. 2 and col. 3, line 55 – col. 4, line 37), wherein

said flow channel being flat and uniform in thickness thereof (38, Figs. 1-2), and further comprises a buffer portion (see area surrounding 48, Fig. 2) neighboring to one of an upstream side (see 56 near 52, Fig. 2) and a downstream side (see 56 near 54, Fig. 2) of said flow channel, said buffer portion being coupled to one of an inlet (52, Fig. 2) and outlet (54, Fig. 2) of the liquid crystal panel for the liquid coolant circulating through the liquid crystal panel, and to the pump and to the radiator to form the closed loop liquid cooling cycle (see Fig. 2).

Braun does not necessarily explicitly disclose said flow channel defines a high-resistance flow channel.

However, Numata discloses a liquid crystal panel (2, Figs. 1, 2, 4-8 and 10-15, and 11, Figs. 3 and 8-9) for use in a liquid crystal projector (see Fig. 3), comprising:

two (2) pieces of transparent substrates (51 and 52, Fig. 2), enclosing a liquid crystal between them (50, Fig. 2; col. 8, lines 52-63); and further

at least a transparent plate (see 3b, Fig. 1, for instance), being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to form a flow channel for a liquid coolant circulating between them (see area containing 5, Figs. 1, 4-8 and 10-15; col. 9, lines 6-13), wherein

said flow channel defines a high-resistance flow channel being flat and uniform in thickness thereof (see channel containing 5 in between 2 and 3b, Fig. 1, for instance), and further comprises a buffer portion neighboring to one of an upstream side and a downstream side of said high-resistance flow channel (see larger areas containing 5 at upstream and downstream sides of high-resistance flow channel, Fig. 1, for instance) (The high-resistance flow channel is considered to have a "high-resistance flow" since it occupies a smaller area relative to the "buffer portions" which occupy a larger area.).

It would have been obvious to one having ordinary skill in the art at the time of applicant's invention to incorporate said flow channel defining a high-resistance flow channel, as in Numata, into the liquid crystal panel of Braun to form a thinner flow channel wherein liquid coolant flows more rapidly to not obstruct the image being viewed.

Regarding **claim 5**, Braun discloses a liquid cooling apparatus (see Fig. 2) for cooling a liquid crystal panel (see 10, Fig. 1, and 46 and 48, Fig. 2) for use in a liquid crystal projector (col. 5, lines 5-13), said panel having two (2) pieces of transparent substrates (28 and 42, Fig. 1), enclosing a liquid crystal (12, Fig. 2) between them, with a liquid coolant (see 56, Fig. 2) circulating through said panel, comprising:

at least a transparent plate (30, Fig. 1), being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to define therebetween a flow channel (38, Figs. 1-2) being flat and uniform in thickness thereof, covering a liquid crystal panel area (see 10, Fig. 2) of said liquid crystal panel, and also a buffer portion (see area surrounding 48, Fig. 2) neighboring to said flow channel, said buffer portion being coupled to one of an inlet (52, Fig. 2) and outlet (54, Fig. 2) of said liquid crystal panel for the liquid coolant circulating through said liquid crystal panel (see Fig. 2 and col. 3, line 55 – col. 4, line 37); further

a driving means (62, Fig. 2) for circulating the liquid coolant through said liquid crystal panel and being connected to said buffer portion of said liquid crystal panel (see Fig. 2); and

a heat radiator means (60, Fig. 2) coupled to said driving means and to said liquid crystal panel for radiating heat of said liquid crystal panel, which is received in said flow channel into an outside, whereby building a closed loop liquid cooling cycle including said liquid crystal panel, said driving means and said heat radiator means (see Fig. 2).

Braun does not explicitly disclose a plurality of liquid crystal panels, and a high-resistance flow channel.

However, Numata discloses a liquid cooling apparatus for cooling liquid crystal panels (2, Figs. 1, 2, 4-8 and 10-15, and 11, Figs. 3 and 8-9) for use in a liquid crystal projector (see Fig. 3), each panel having two (2) pieces of transparent substrates (51 and 52, Fig. 2), enclosing a liquid crystal (50, Fig. 2; col. 8, lines 52-63) between them, with a liquid coolant (5, Figs. 1, 4-8 and 10-15; col. 9, lines 6-13) circulating through each panel, comprising:

at least a transparent plate (see 3b, Fig. 1, for instance), being disposed opposing to one surface of said two (2) pieces of transparent substrates, so as to define therebetween a high-

resistance flow channel being flat and uniform in thickness thereof (see channel containing 5 in between 2 and 3b, Fig. 1, for instance), covering a liquid crystal panel area of said liquid crystal panel, and also a buffer portion neighboring to said flow channel (see larger areas containing 5 neighboring said high-resistance flow channel, Fig. 1, for instance) (The high-resistance flow channel is considered to have a "high-resistance flow" since it occupies a smaller area relative to the "buffer portion" which occupies a larger area.).

It would have been obvious to one having ordinary skill in the art at the time of applicant's invention to incorporate a plurality of liquid crystal panels, and a high-resistance flow channel, as in Numata, into the liquid cooling apparatus of Braun, since a projection device normally has three liquid crystal panels for displaying red, green and blue light, and to form a thinner flow channel wherein liquid coolant flows more rapidly to not obstruct the image being viewed.

Response to Arguments

6. Applicant's arguments with respect to claims 1, 3 and 5 have been considered but are moot in view of the new ground(s) of rejection as stated above.

Applicant has amended independent claims 1, 3 and 5 to include at least the limitations of a "closed loop" liquid cooling cycle, and an "inlet" and an "outlet" of the liquid crystal panel, and has argued that this distinguishes over Numata. Examiner agrees, therefore the previous rejections under 35 U.S.C. 102(b) have been overcome. However, upon further consideration, this does not appear to be a patentable distinction since Braun discloses these features as

discussed above. Therefore, the new grounds of rejection under 35 U.S.C. 103(a) over Numata and Braun are considered appropriate.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PAISLEY L. ARENDT whose telephone number is (571)270-5023. The examiner can normally be reached on MON - FRI, 9:00 a.m. - 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Robinson can be reached on 571-272-2319. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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